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Descriptors-Autoinstructional Aids, Branching, Classroom Techniques, Computer Assisted Instruction, *Computer Programs, Individualized Instruction, Individualized Programs, Instructional Materials, *Instructional Programs, Instructional Technology, Linear Programing, *Programed Instruction, *Programing, Prompting, Sequential Programs, Teaching Techniques

An undertaking designed to teach the fundamental concepts of programing makes the learner learn frame writing by means of frames. A sliding card gradually discloses the two basic sequences which programs usually follow--the linear and the branching sequences. A branching sequence may be normal or remedial, a frame regular or mainstream. A linear sequence may have a wash ahead or a wash back. A typical program frame comprises a stimulus, a response and a feedback. Prompts or cues, which are used to stimulate a response, may be formal or thematic. A frame may be intermediate or terminal, and cues should be faded out gradually when the frames are terminal. The programer must avoid copying frames and overprompting. RULEG (rule first and example afterwards) and EGRUL (the reverse process) are two general programing strategies. A response may be overt or covert and must be related to the instructional content. A stimulus may be generalized or discriminative, and the programer must control both. He must deal, not only with response acquisition, but also with its maintenance. Chaining, which may refer forwards or backwards, is when instruction includes sequencing of several tasks. (GO)

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AN INTRODUCTION TO PROGRAMMING

MONOGRAPH #14

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USOE Project 5-0269

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experimental analyses of student behavior

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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A N I N T R O D U C T I O N T O

P R O G R A M M I N G

Monograph #14

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Outline of Program Content

Frames:	
1 - 24	Types of Sequences
25 - 26	Selected & Constructed Responses
27 - 44	Prompting
45 - 50	Review
51 - 60	Strategies: Ruleg & Egrul
61 - 70	Responses
71 - 75	Transfer of Stimulus Control
76 - 88	Stimulus Generalization & Discrimination
89 - 90	Copying Frames
91 - 97	Stimulus Discrimination Sequencing
98 - 119	Maintenance
120 - 134	Chaining

Fundamentals of Programming

- Constructing the Program Outline -

This program is designed to teach you the fundamental concepts of frame writing. The emphasis is on the preparation of programmed instructional materials which are appropriate for programming in the motion picture medium.

Most effective programs are written for a particular audience. This program is intended for use by teachers in general, and particularly by those teachers who have previously worked through all or part of some programmed instructional material.

In order for this material to be maximally effective, it is important for you to follow a few rules. The guidelines below should be read prior to turning to the first instructional frame of the sequence.

Guidelines

1. The instructional material for this program is divided into small, numbered units called <u>frames</u>. Near the end of each frame you will be asked to answer a question either by selecting from among several choices, or by writing your own answer.

   In order to use the program effectively, provide yourself with a 5 x 8 card. Slide the card down the page until you see a double row of dots, like this: ... ...
   ... ...

Stop when you see these dots, read the material, and answer the question. When finished, slide the card down until you see a row of asterisks:

****

Stop when you see the asterisks. The material just uncovered contains the answer to the previous question and tells you whether or not you were correct. You then proceed to the next frame and double row of dots.

Get your 5 x 8 card now and practice these procedures on the remainder of the guideline frames, i.e., 2-4.

****

2. In order to assist the learner in identifying <u>important</u> terms or concepts, some words or phrases will be underlined or capitalized. If a word is underlined or capitalized, it means that word is _____.

... ...
... ...

2. Answer: important

****

3. On many occasions you will be asked to construct an answer, either in response to a direct question, or by filling in blank lines. When blank lines are given, the <u>length</u> and <u>number</u> of blanks should suggest the answer. Thus, a three-word answer is suggested by three blanks. If an answer is to be made in one word, how many blanks will there be?

a) one; b) two; c) any number.

... ...
... ...

3. Answer: choice a), one

****

4. On other occasions you will be asked to select an answer from among those given. When several choices are given, write down the <u>letter</u> of the answer

you chose. What should you write down when answering multiple choice questions?

a) the full answer; b) the letter of the answer you chose; c) a key word or two

... ...
... ...

4. Answer: b)

****

As you can see, the guidelines are simple and easy to follow. You are now ready to turn to the next page and begin the program.

1. Programmed instructional materials (which we call <u>programs</u>) usually follow one of two basic sequences. One sequence is called <u>linear</u>, because every learner follows the same line or route through the program.

When every learner follows the same instructional path, the sequence is called _____.

... ...
... ...

1. Answer: linear.

****

2. The other basic sequence is called <u>branching</u>. Branching programs are so named because they provide places where learners can branch off into alternative paths of instruction. In branching programs it is possible for two learners to follow quite different routes through the same program.

What kind of a program allows learners to take varying instructional routes?

a) linear; b) branching

... ...
... ...

2. Answer: b)

****

3. Branching programs provide the learner with several response alternatives from which his is to <u>select</u> the one he thinks is correct. In addition, depending on the learner's selection, he is directed to <u>different</u> frames in the program.

Linear programs could also provide several response alternatives. Therefore, the critical difference between branching and linear programs

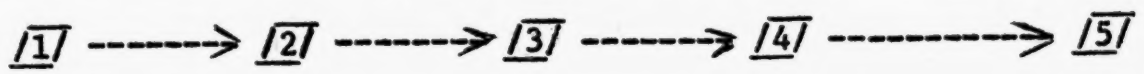
is that in a branching program different choices lead to _____ places in the program.

... ...
... ...

3. Answer: different, various, etc.

****

4. In the diagram below, each numbered box represents a program frame. The arrows indicate the possible sequences of instruction. Does the diagram depict a linear or a branching sequence?



... ...
... ...

4. Answer: linear. Each learner must go from frame 1 to 2, from 2 to 3, etc., regardless of his responses.

****

5. Suppose a program frame provided the following response choices: a) red - turn to page 24; b) blue - turn to page 21; c) green - turn to page 17; d) yellow - turn to page 22.

What type of program sequence is being used?

... ...
... ...

5. Answer: branching. One would go to different places in the program depending on the response selected.

****

6. By now it should be clear that in linear programs there is but one sequence for all learners to follow. However, in branching programs the

sequence depends upon the particular response selected by the learner, and varies from one learner to another.

a) a program with one sequence for all learners is called _____.

b) a program in which the sequence varies depending on the learner's response is called _____.

... ...
... ...

6. Answer: a) linear; b) branching

****

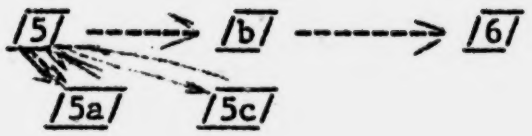
7. Branching programs can be very complex and lengthy. Theoretically, each incorrect answer selected could lead to a different sequence, and errors made thereafter would lead to further sequences, etc., until the magnitude of the matter staggers one's imagination. In actual practice, however, branching is usually limited to one of two types, normal and remedial. How many types of branching are typically used?

... ...
... ...

7. Answer: 2

****

8. In a normal branching program, the learner who selects an incorrect response is directed to a frame containing an additional explanation. Following the additional explanation, the learner is directed back to the previous frame and asked to select a different answer. Study the diagram below. In frame 5, choices a, b, and c were given. Choice b was correct and directed the learner to frame 6, the next regular frame.



What would the learner find in frames 5a or 5c? _____ _____

... ...
... ...

8. Answer: additional explanation.

****

9. If a learner never chose an incorrect response, he would see only the regular, or <u>mainstream</u> frames. Each error in a normal branching program adds one additional frame to the sequence.

If a normal branching program had 50 mainstream frames, how many frames would a learner see who made 5 errors in the program?

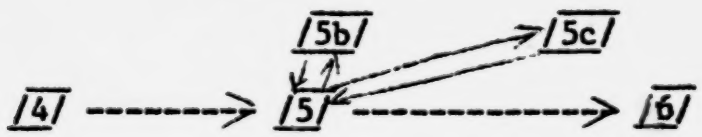
a) 45 frames; b) 50 frames; c) 55 frames; d) 60 frames

... ...
... ...

9. Answer: c) He would see the 50 mainstream frames plus 5 frames containing additional information.

****

10. Study the diagram below of a normal branching sequence. Assume a learner read frame 5 and chose response b). After reading an additional explanation on frame 5b, he was directed back to mainstream frame 5 to try again. If, on a second try, he chooses c), where will he be directed after reading the explanation on 5c? _____ ____



... ...
... ...

10. Answer: frame 5. In a normal branching program a learner who selects an incorrect answer is returned to that mainstream frame for another attempt at the correct answer.

****

11. The program you are now reading is a (linear/branching) program.

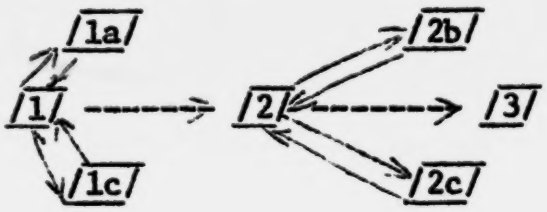
... ...
... ...

11. Answer: linear. Each learner goes through the same sequence even though one may proceed at his own rate of speed. There is no branching.

****

12. What kind of sequence is depicted by each diagram below?

a) /1/ -----> /2/ -------> /3/ -------> /4/

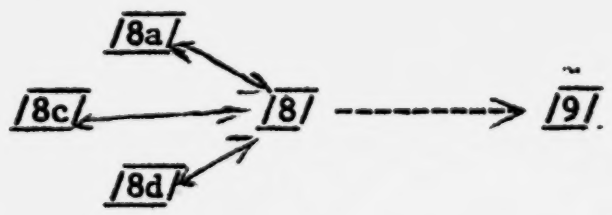
b) 

... ...
... ...

12. Answer: a) linear; b) branching

****

13. In a normal branching sequence the learner who selects the correct response is directed to the next mainstream frame. In the diagram below, if frame 8 provided choices a, b, c, and d, which response must have been the correct one?



... ...
... ...

13. Answer: b. All other choices (a, c, and d) direct the learner to additional explanations, while b must lead to the next mainstream frame, i.e., frame 9.

****

14. From the preceding material you learned that in a normal branching sequence a learner never branches more than <u>one</u> frame away from a mainstream frame. Each branching frame leads back to a mainstream frame.

The second type of branching frequently used is called <u>remedial</u> branching because it provides a full sequence of remedial frames when errors are made.

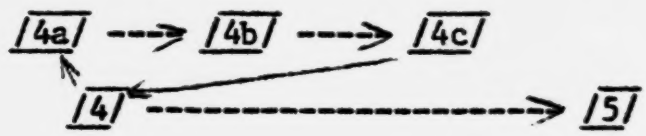
The two kinds of branching programs frequently used are _____ and _____.

... ...

14. Answer: <u>normal</u> and <u>remedial</u> (in either order).

****

15. The distinction between normal and remedial branching is quite simple. In normal branching, each error leads to <u>one</u> additional frame from which the learner returns to the previous mainstream item. In remedial branching, an error leads to <u>two or more</u> additional frames and from there either back to the previous mainstream frame or on to the next one. Whay type of branching sequence is shown below?



... ...
... ...

15. Answer: remedial.

****

16. Which type of sequence is described by each statement below?

a) Each learner proceeds through the same sequence of frames.

b) Each incorrect response leads to one frame containing an additional explanation, and then directs the learner back to the original mainstream frame.

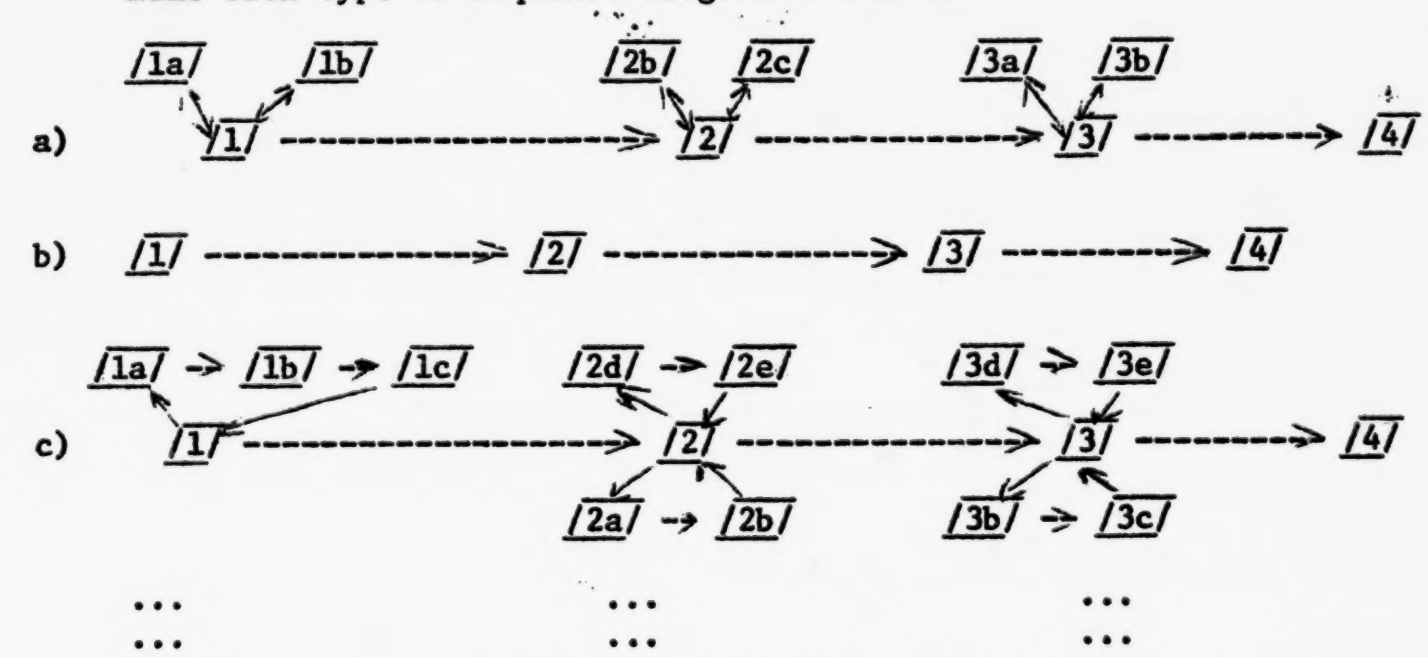
c) An incorrect response directs the learner to two or more frames intended to remedy some deficiency of the learner.

... ...
... ...

16. Answer: a) linear; b) normal branching; c) remedial branching

****

17. Name each type of sequence diagrammed below.



... ...
... ...

17. Answer: a) normal branching; b) linear; c) remedial branching

****

18. From the previous material you can see that the remedial branching sequence provides for instruction which more closely approximates a tutorial situation than the other sequences. This is so because with it one can tailor the instruction to the needs of learners with various degrees of proficiency or deficiency.

While the normal branching sequence can, to some extent, meet the requirements of particular learners, it must remedy any deficiency in one additional frame. Some linear programs also attempt to make adjustments for learners who require more practice or have already demonstrated mastery of the skill to be learned. This is done by directing the learner to either go back and repeat several frames, or to jump ahead and skip several frames.

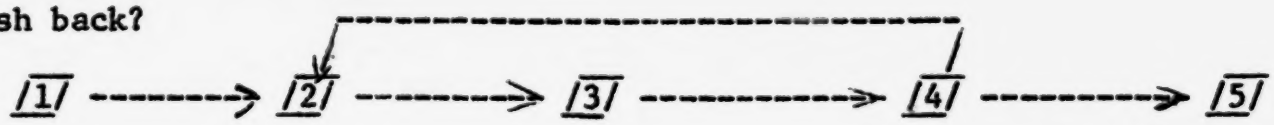
A learner in a linear program who makes several errors may be directed to go back and _____ several frames.

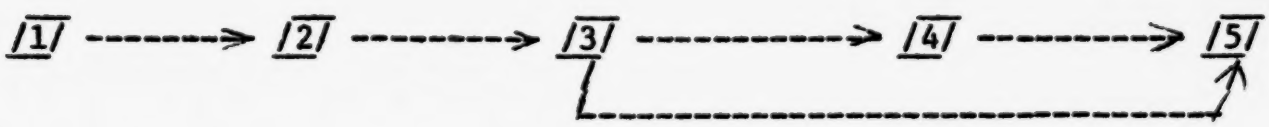
... ...
... ...

18. Answer: repeat

****

19. If a learner in a linear program is directed to go back and repeat several frames, it is called a wash back. If he is directed to move ahead and skip several frames it is called wash ahead. Which diagram below shows a wash back?

a) 

b) 

... ...
... ...

19. Answer: a) In diagram a) one might wash back and repeat frames 2 and 3, while in diagram b) the learner might be directed to skip frame 4, or wash ahead.

****

20. The two techniques for adjusting linear programs to learners who need more practice or who have already mastered the task are called: _____ _____ and _____ _____.

... ...
... ...

20. Answer: wash back and wash ahead.

****

21. Complete the statements below.

a) Branching programs are usually either _____ or _____.

b) Linear programs may use adjustive techniques called _____ _____ or _____ _____.

... ...
... ...

21. Answer: a) normal or remedial (either order)

b) wash back or wash ahead (either order)

****

22. Suppose the answer to the preceding frame had read, "if your response was incorrect, go back to frame 18 and repeat frames 18 to 21." What would this technique be called?

... ...
... ...

22. Answer: wash back.

****

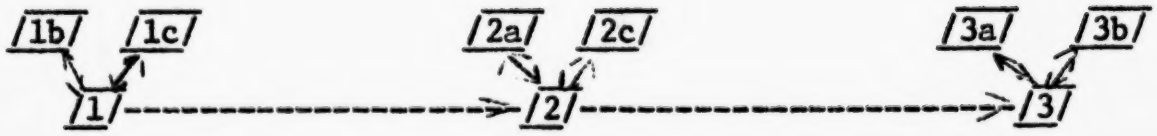
23. Beside each diagram below mark the letter of the type of sequence:

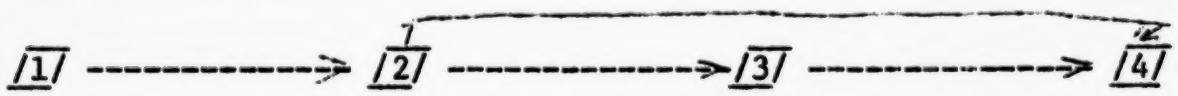
a) linear wash back.

b) linear wash ahead.

c) normal branching.

d) remedial branching.

1) 

2) 

3)

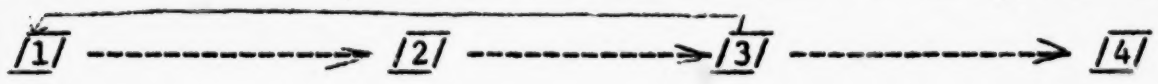
4)

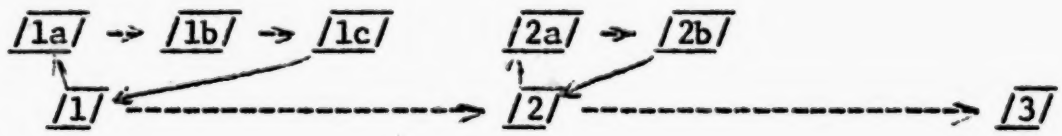
. . . . . .
. . . . . .

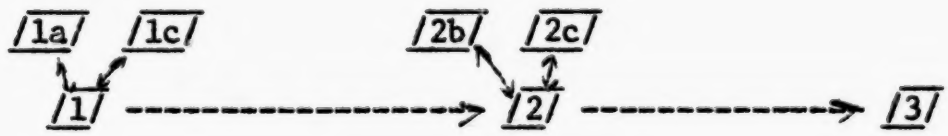
23. Answer: 1) c; 2) b; 3)d; 4) a

****

24. Beside each diagram below, write the name of the type of sequence:

a) 

b) 

c) 

d)

. . . . . .
. . . . . .

24. Answer: a) linear wash back

b) remedial branching

c) normal branching

d) linear wash ahead.

****

25. Now that you can identify and name the type of sequence when shown a diagram, we shall turn our attention to some of the characteristics of the frames of a sequence.

A typical program frame consists of the following:

1) Some information and a question about it, called the stimulus.

2) An answer to be given by the learner, called the response.

3) The correct answer, called confirmation or feedback.

Another name for the learner's answer is _____.

... ...
... ...

25. Answer: response.

****

26. The response is usually called for after some new material has been presented. The response, thus, comes near the end of the frame. When a frame asks the learner to write out an answer, the answer is called a constructed response. When the learner is to choose from among several alternative answers provided, his answer is called a selected response. What kind of response will you make to this frame?

a) constructed response

b) selected response

... ...
... ...

26. Answer: b) a selected response.

****

27. Throughout this program certain words have been emphasized by the use of underlining. Underlining is one technique a programmer uses to prompt the learner to make the correct response. For constructed responses the number and length of blanks provide prompts for the correct response.

Prompts are used to help the learner make the _____ response.

... ...
... ...

27. Answer: correct

****

28. Another name for a prompt is "cue." There are many ways for a program writer to cue, or prompt, a correct response.

In Frame 26 what technique was used to cue (prompt) a selected response? a) underlining; b) the number of blanks to be filled in.

... ...
... ...

28. Answer: a. You should have selected a, underlining. The number and length of blanks to be filled in, choice b, is related to constructed responses, not selected responses.

****

29. Prompting is a helpful device when a learner is in the process of acquiring a new skill. However, if the learner is eventually to make the correct response in the absence of prompts, the program should gradually withdraw the use of prompts. The gradual withdrawal of prompts is called fading.

Where would one expect to find more frequent prompts?

a) at the end of the program; b) at the beginning of the program

... ...
... ...

29. Answer: b

****

30. When deciding whether to use a prompt or not, one needs to be able to distinguish between terminal frames and intermediate frames. A terminal frame is one that calls for the learner to demonstrate his mastery of one of the program objectives. Prompts should not be used in terminal frames. An intermediate frame is a part of the instruction and practice and assumes that the learner has not yet mastered the objective. Prompts are used, but gradually faded, during intermediate frames.

a) Prompts should not be used in _____ frames.

b) Prompts should gradually be faded during _____ frames.

... ...
... ...

30. Answer: a) terminal

b) intermediate

****

31. In a terminal frame, would you expect to find a cue (or prompt)? ___

... ...
... ...

31. Answer: No

****

32. In the terminal frames of a program the learner is expected to make the desired response with little or no help. Therefore, a good program writer

gradually _____ all prompts.

... ...
... ...

32. Answer: withdraws, fades, removes, etc.

****

33. Prompts are classified as either formal prompts or thematic prompts. A formal prompt indicates the form of the response, for example the number of words, the length of words, etc. A thematic prompt suggests the theme or meaning of the response; for example, it may draw an analogy with some previously-learned or -known topic.

Which of the following exemplifies a thematic prompt?

a) The primary colors are _____, _____, and _____.

b) Just as smoke does from a chimney, so hot air also _____.

... ...
... ...

33. Answer: b. Obviously this prompt will be effective only if the learner knows that smoke rises from a chimney.

****

34. Let's try another one. What kind of a prompt is given below?

The names of the Great Lakes are: _____, _____, _____, _____, and _____.

a) formal; b) thematic

... ...
... ...

34. Answer: a) formal

****

35. In the spaces below write the names of the two types of prompts.

_____ and _____

... ...
.. ..

35. Answer: formal and thematic (in either order)

****

36. Phrases such as "similar to golf," or "like logic statements," or "as in literature" refer to meaming and are, therefore, examples of _____ prompts.

... ...
... ...

36. Answer: thematic

****

37. Remember, responses may be heavily prompted in intermediate frames, especially in the beginning, or not prompted, as in terminal frames. Is the following frame more likely to be an intermediate or a terminal frame? What is/are the primary color(s)?

... ...
... ...

37. Answer: terminal. The question provides the minimum words necessary to elicit the response. Fruthermore, it does not suggest whether the answer is singular or plural.

****

38. Beside each statement below write the name of the type of prompt used.

_____ a) The colors of the American flag are ____, _____, & _____.

_____ b) The type of government in New Zealand, like that of the United States, is _____.

... ...
... ...

38. Answer: a) formal; b) thematic

****

39. Any particular frame could contain both a formal and a thematic prompt, for example:

Like the American flag, the French flag is composed of three colors: _____, _____, and _____.

a) What is the thematic prompt?

b) What is the formal prompt?

... ...
... ...

39. Answer: a)"Like the American flag"

b)The number of blanks (or spaces and commas)

****

40. Responses to a given frame may also be prompted by information received in previous frames. But whether the prompt is in the current frame or a previous frame, it will still be either _____, _____, or a combination of the two.

... ...
... ...

40. Answer: formal, thematic (in either order)

****

41. Write a definition of a thematic prompt.

... ...
... ...

41. Answer: Any words or cues which suggest the theme or meaning of the response. (Or any answer which means the same as this one)

****

42. Write a definition of a formal prompts.

... ...

42. Answer: Any information which indicates the form of the response, either number of words, length of words, or the like. (or any answer which means the same as this one)

****

43. While prompting is a valuable characteristic of early instructional frames, there are two common mistakes which are frequently made by beginners. One of these errors is <u>overprompting</u>. Overprompting occurs when the prompt contains so much information that the likelihood of any incorrect responses is completely removed.

Here is an example of overprompting. Suppose the desired correct response is the word "apple," and the alternatives provided were "apple," "pear," and "banana."

An _____ has seeds.

Correct grammar alone eliminates all choices except the correct one. Which form below would correct that mistake?

a) a

b) an

c) a/an

... ...

43. Answer: c)

****

44. The other pitfall of the beginning frame writer is called the copying frame. While the copying frame can occur in many forms, it always means that the learner merely has to copy a key word or phrase and need not read the entire frame. This error is compounded when several successive frames all call for the same response.

Here is an example of a copying frame:

"Roger Maris hit 61 homeruns in one season. Who hit 61 homeruns in one season? _____ _____"

Now name the two common errors of beginning frame writers.

a) _____

b) _____ _____

... ...
... ...

44. Answer: a) overprompting; b) copying frames.

****

45. Now let's review some of the material you have just covered. Read the sample frame below.

A milligram is:

a) 100 times as large as a gram. (turn to p. 27)

b) 1/10 times as large as a gram. (turn to p. 21)

c) 1/100 times as large as a gram. (turn to p. 28)

d) 1/1000 times as large as a gram. (turn to p. 26)

In what type of a program would this frame be found?

... ...
... ...

45. Answer: branching. Note that each answer in a branching frame always includes directions to the learner's next frame.

****

46. In branching frames the correct response should not consistently be the answer associated with the highest or lowest page number. Rather, the position of the correct response and page position should be scrambled. The relative page position and correct response position should be varied to avoid _____ the response.

... ...
... ...

46. Answer: prompting, or overprompting. (If the correct answer is always associated with the highest page number, one would not need to read the frame at all.)

****

47. Suppose you had just written the response "blue" to a frame numbered 15. On the next frame, 16, you find the statement, "If you answered blue you are correct; skip ahead to frame 21. If you made any other response, continue with frame 16."

What type of sequencing is illustrated by this statement?

a) remedial branching

b) linear wash back

c) normal branching

d) linear wash ahead

... ...
... ...

47. Answer: d

****

48. Pretend you are working through a program in which your selected response

has directed you from frame 120 to 120a. From 120a you are directed to 120b, then to 120c, 120d and 120e. After working frame 120e, you are directed to frame 121. What type of program sequence is this?

... ...
... ...

48. Answer: remedial branching

****

49. Complete the following sentences:

a) Responses made by choosing from among alternatives are called _____ responses.

b) Responses made by writing out oné's own answer are called _____ responses.

... ...
... ...

49. Answer: a) selected; b) constructed

****

50. If all the incorrect alternative responses can be eliminated by the cue, the writer has made the error of _____(a). When the learner can merely write a key word or phrase for the answer without reading the entire frame, the faulty frame is called a/an _____ _____(b).

... ...
... ...

50. Answer: a) overprompting; b) copying frame

****

STOP HERE IF YOU CANNOT CONTINUE WITH THE PROGRAM FOR AT LEAST ANOTHER 20 MINUTES WITHOUT INTERRUPTION. If you stop here, begin with frame 45 when you resume work. If you are continuing, proceed to frame 51.

****

51. Writing program frames looks like a simple task, but don't be deceived into taking it lightly. Frames are usually very short, but a long succession of short frames can become boring to a learner. Varying the length helps overcome boredom.

The content of each frame must help the learner progress toward achieving the program objectives, and should fit logically into the sequence of frames.

Frames which do not help the learner acquire the program objectives should be _____.

... ...
... ...

51. Answer: eliminated, removed, rewritten, etc.

****

52. In program writing, as in all instruction, there are a number of strategies one may employ to assist the learner in acquiring the objectives. However, in program writing the commitment to a particular strategy is more apparent since all the instruction is in a visible format.

One general strategy is to give the learner a rule, a complete example, and then to follow this with an incomplete example which the learner is to complete. When this strategy is employed, the complete example probably serves as a thematic _____ for the correct response.

... ...
... ...

52. Answer: prompt.

****

53. The strategy of giving a rule first, then an example, is called Ruleg. This name is derived from rule and eg (example). It should be apparent that

the procedure of going from the general (rule) to the specific (example) is also associated with the concept of deductive reasoning. Which sequence below illustrates a Ruleg strategy?

a) In 1/4, 4 is the denominator. In 2/3, 3 is the denominator. Define denominator.

b) A denominator is the lower numeral in a fraction. In 2/5, 5 is the denominator. What is the denominator in 3/4?

... ...
... ...

53. Answer: b); the rule is followed by a complete example and then an incomplete example.

****

54. In the Ruleg strategy, prompting is gradually reduced as the learner acquires greater proficiency with the task. Even though the rule might not be given more than once, it will, hopefully, still function as a prompt for the correct response.

Since Ruleg is patterned after deductive reasoning, you might well expect the opposite, Egrul, to be patterned after _____ reasoning.

... ...
... ...

54. Answer: inductive

****

55. Egrul is another general instructional strategy. Here, one would provide a number of examples from which the learner is to induce the rule. Usually the deductive strategy (Ruleg) requires less instructional time for the learner to master the objective. If time is not important, however,

inductive strategy (Egrul) may under certain conditions produce longer retention. (Actually, it is not clear whether the greater retention is due to the Egrul strategy or the increased period of instructional time.)

Learner mastery of a program objective will usually take less instructional time if the _____ strategy is employed.

... ...
... ...

55. Answer: deductive or Ruleg

****

56. Complete the following statements:

a) The Egrul system involves _____ reasoning.

b) The Ruleg system involves _____ reasoning.

... ...
... ...

56. Answer: a) inductive. Examples are used to induce rules.

b) deductive. Rules are given, from which examples are deduced.

****

57. Read the sample frame below and then decide whether the Ruleg or Egrul strategy was employed.

When multiplying any decimal number by 10, simply move the decimal point in the multiplicand one place to the right.

If you multiply 3.71 by 10 the result would be 37.1.

What is 9.28 multiplied by 10?

The sample frame employed the _____ strategy.

... ...
... ...

57. Answer: Ruleg

****

58. Consider the following sample program frame..

3/4 is a <u>proper</u> fraction, as are 1/8; 2/5; 5/6; and 1/3. However, 5/4 is not a proper fraction, nor are these: 9/8, 6/5, 10/6, 5/3. Now see if you can define a proper fraction.

Which programming strategy was employed? a) Ruleg; b) Egrul

... ...
... ...

58. Answer: b), Egrul

****

59. Now complete the two statements below.

1) The Ruleg strategy is to first give the learner _____(a)_____, followed by _____(b)_____.

2) The Egrul strategy is to give the learner _____(c)_____ from which he is to induce _____(d)_____.

... ...
... ...

59. Answer: 1) (a) the rule; (b) an example (or examples)

2) (c) examples; (d) the rule

****

60. Beside each <u>initial</u> statement below from a program frame, mark whether Ruleg or Egrul strategy is being employed.

_____ a) To square a number is to multiply that number by itself.

_____ b)5 squared is 5 . 5, or 25.

... ...
... ...

60. Answer: a) Ruleg; b) Egrul

****

61. Ruleg and Egrul strategies determine the manner in which the instructional material is presented. Other strategies relate to the type of response the learner is to make in a given frame. You have already learned that responses can be either constructed or selected. Both constructed and selected responses require the learner to make or write out an answer that is v sible. Visisble, or observable, responses are called overt responses.

If a learner writes the rule for squaring numbers, he is making a/an _____ response.

... ...
... ...

61. Answer: overt, visible, or observable. (In this case the written answer would also be a constructed response)

****

62. Covert responses are not visible to anyone. Examples of covert responses are listening, looking, thinking, silent reading, mentally selecting or constructing an answer, etc.

While there is no way of knowing whether someone else is making a covert response, we usually infer that one has been engaged in covert responding when he makes an overt response. We infer that learners engage in some private, mental response before making a visible overt response.

In this program, each frame has asked for a constructed or selected

response. Since these are visible responses, they may be called _____ responses.

... ...
... ...

62. Answer: overt

****

63. If a driver looked at the traffic conditions and thought he had better reduce his speed, he would be making a/an _____ response.

... ...
... ...

63. Answer: covert. Looking and thinking are <u>not</u> <u>observable</u> responses.

****

64. If a driver depressed the brake pedal in his car, what kind of response has he made?

a) overt

b) covert

... ...
... ...

64. Answer: overt. One may <u>observe</u> the response of depressing a brake pedal.

****

65. Mark overt or covert beside each learner response given below.

_____ a) The learner decides that choice <u>a</u> is correct.

_____ b) The learner writes the letter <u>a</u> in the answer blank.

_____ c) The learner reads that choice <u>b</u> was the correct answer.

... ...
... ...

65. Answer: a) covert. Deciding is a private, mental process.

b) overt. Writing is an observable response.

c) covert. Reading is not directly observable; it is inferred from eye position and movement.

****

66. If a program frame does not require an overt response, there is no way of insuring that the learner has read the frame. Suppose a frame presented some instructional material and then directed the learner to the next frame. While some learners will make the covert responses of reading and thinking about the material, others might merely read the direction to proceed to the next frame. Reading the direction is, of course, a covert response, but it is not made in relation to the important part of the frame, the instructional content.

Proceed to frame 67.

****

67. The preceding frame illustrated a frame which did not call for an overt response. Hopefully, you read the material anyway and are able to answer the following question.

To which aspect of a frame should the question and response be directed?

a) The strategy for presenting material.

b) The instructional content.

c) The directions and format of a frame.

... ...
... ...

67. Answer: b. (If the response is not related to the instructional

content, it is irrelevant and merely detracts from the program)

****

68. Learning is facilitated by having the learner respond during the instructional phase. While it is not absolutely clear whether overt responses are superior to covert responses in this regard, most program writers "play it safe" by requiring overt responses. Also, overt responses help the writer to improve his program because he can examine the frequency and types of errors made by learners.

In copying frames and cases of overprompting the learner might respond overtly even though the instructional material did not elicit a/an _____ response.

... ...
... ...

68. Answer: covert

****

69. Complete the statements below:

a) When mentally constructing or selecting an answer, one is making a/an _____ response.

b) When writing out one's constructed or selected answer, one is making a/an _____ response.

... ...
... ...

69. Answer: a) covert; b) overt

****

70. Every appropriate frame should elicit some type of learner response to the instructional content which helps him progress toward the program objec-

tives. Regardless of whether the response is overt or covert it must be content related. Which requested response below is related to the objectives of this program?

a) The total number of frames in this program is _____.

b) When incorrect responses lead one to a sequence of two or more additional frames, the sequence is called _____ _____.

... ...
... ...

70. Answer: b) the objectives of this program do <u>not</u> include counting frames. However, they do include the ability to name and identify the "remedial branching" sequence.

****

71. In the previous frame you were told that the instructional material should elicit a response which is appropriate to the objectives of the program. That part of the frame which elicits the response is called a <u>stimulus</u>, because it stimulates, or controls, the response.

If a driver is stopped for a red traffic light, what stimulus would cause him to proceed?

... ...
... ...

71. Answer: a green light (or any equivalent answer).

****

72. Suppose a driver saw a pedestrian in a crosswalk and stopped his car.

a) The sight of the pedestrian was a/an _____.

b) Stopping the car was the _____.

... ...
... ...

72. Answer: a) stimulus; b) response

****

73. Most learning involves bringing some already existing response under the control of a new stimulus. For example, most six-year old children can say the word "red," and when asked the color of a red object will respond "red." However, in learning to read the word "red" one must make the response to the printed stimulus RED. Thus the existing response (saying "red") must also come to be controlled by a new stimulus (a printed word). This process is called transfer of stimulus control.

In the above example, is the child learning a new response?

... ...
... ...

73. Answer: no, he already could say "red."

****

74. Very few new responses are learned in school; rather, existing responses come to be elicited by new or different stimuli. This process is called

_____ _____ _____ _____.

... ...
... ...

74. Answer: transfer of stimulus control.

****

75. Unless some serious disability exists, any first grader can say the word "four." If a programmer wishes a first grader to say "four" in response to "2 + 2 =," he is attempting to transfer _____ _____.

... ...
... ...

75. Answer: stimulus control

****

76. Again, suppose a young child could answer "red" when asked the color of his toy firetruck, but was confused when asked the color of other red objects. His mother, a good instructional manager, transferred stimulus control of his response by showing him other red objects, asking him to say "red," and praising him when he did so. When the child could respond "red" to a variety of red objects which differed in shape and size, stimulus generalization had occurred.

Stimulus generalization exists when the learner can make the same response to many examples of the stimulus. In the above example, the same response, "red," was made to a variety of red stimuli.

Because you can respond "triangle" to any three-sided figure, regardless of its size or position, _____ _____ has taken place.

... ...
... ...

76. Answer: stimulus generalization

****

77. It should be apparent that stimulus generalization is a very important part of learning. Without it we would, for instance, have to give a different name or label to each example. The very notion of a "concept" is built around stimulus generalization. One has acquired a concept when he can give the same response to any example of that concept. Thus one has formed the concept "red" when he can correctly identify and label red objects even though they vary in shape, size, position, density, etc.

Stimulus generalization is accomplished by the process called:

... ...
... ...

77. Answer: transfer of stimulus control.

****

78. Stimulus generalization exists when a learner correctly makes the _____ response to several different _____.
(a) (b)

... ...
... ...

78. Answer: a) same, identical; b) stimuli, or examples

****

79. Stimulus generalization is only one side of the coin, however. If our young friend learning to generalize red was shown only red objects, he might well learn to say "red" when asked the color of any object, even if it were green cr blue. Obviously we want him to say "red" to red objects only; that is, we want him to be able to discriminate red from other colors.

If he could pick out the red balloon when shown three balloons (red, green, and blue), we would say he could discriminate red. Stimulus discrimination exists when he only responds "red" to red objects.

Suppose the following sets of objects were to be used in teaching the concept "triangle." Which could be used to test stimulus discrimination?

a)

b)

... ...
... ...

79. Answer: b)

****

80. In summary, stimulus generalization takes place when the learner makes

the same response to any stimulus illustrating the concept or rule. Stimulus discrimination exists when the learner restricts that response to appropriate stimuli, and/or can select the appropriate stimulus from several choices.

Suppose a boy knows that, in baseball, a foul ball is a "strike," and a ball swung at and missed is a "strike." This suggests that stimulus _____ exists.

... ...
... ...

80. Answer: generalization

****

81. If a first grader has learned to respond "five" to: 5 + 0; 4 + 1; 3 + 2; 2 + 3; 1 + 4; and 0 + 5, but also responds "five" to 4 + 2 and 2 + 4, what essential part of learning is absent? _____ _____

... ...
... ...

81. Answer: stimulus discrimination

****

82. Suppose a young child refers to all persons in a uniform as "policeman." He has learned to _____ (a) but not to _____ (b).

... ...
... ...

82. Answer: a) generalize; b) discriminate

****

83. Much of learning is a two-sided matter. On the one hand it involves stimulus generalization, and on the other, stimulus discrimination. Without the former we could not apply rules or have concepts. Without the latter we

would <u>over</u> generalize and make serious errors.

A two-year old who calls every male "Daddy" is over-_____.

... ...
... ...

83. Answer: generalizing

****

84. Stimulus generalization is taught by having the learner make the same response to several stimuli, all of which are examples of a rule or concept. On the other hand, stimulus discrimination learning involves making the desired response only in the presence of a particular stimulus, called the <u>Discriminative Stimulus</u>, or S^D (pronounced "ess dee"). For example, the S^D for the response "red" is any red object.

For the response "triangle," any closed, three-sided figure would be the _____.

... ...
... ...

84. Answer: S^D (discriminative stimulus)

****

85. Suppose a learner was to be able to identify adverbs when given a list of words, some of which are adverbs and some not. Each adverb in the list is an S^D (discriminative stimulus) for the response "adverb." Each non-adverb is a distracting stimulus, or S^Δ (pronounced "ess delta"). The S^Δ (distracting stimuli) should <u>not</u> elicit the "adverb" response.

a) If the learner responds "adverb" to each S^D in the list, he is demonstrating _____ _____.

b) If the learner does not respond "adverb" to each S^Δ in the list, he is demonstrating _____ _____.

... ...
... ...

85. Answer: a) stimulus generalization; b) stimulus discrimination

****

86. In the context of the above example, every adverb is a/an ____(a) for the response "adverb."

In the foregoing example, adjectives, nouns, verbs, and pronouns all would be considered ____(b)'s.

... ...
... .

86. Answer: a) S^D; b) S^Δ

****

87. Stimulus generalization learning requires only S^D's. Stimulus <u>discrimination</u> learning, however, requires the presence of both S^Δ's and S^D's. Distractors must be present, and the learner who has learned stimulus discirmination does <u>not</u> make the same response to these distractors as he does to the S^D's. Skill in discriminating is perfected by gradually introducing S^Δ's which more and more closely approximate the S^D. For example, in teaching stimulus discrimination of the color <u>red</u>, one might first use green and black as S^Δ's, and near the end of the instruction use pink or violet as S^Δ's, which are more similar to red than are green and black.

Which sequence of S^Δ's should one use in teaching stimulus discrimination of <u>circle</u>?

a)

b)

... ...
... ...

87. Answer: b) The S^{Δ}'s gradually come closer to the shape of a circle, the S^{D}.

****

88. You have had a pretty heavy dose of new terminology in the last few frames, so let's review a few terms here.

a) If one has learned to respond by using a salad fork on a variety of appropriate occasions, he has learned _____ _____.

b) If he has learned <u>not</u> to use his salad fork on inappropriate occasions, he has also learned _____ _____.

c) Each appropriate occasion for using the salad fork is a/an ___ (abbreviate)

d) Each inappropriate occasion for using the salad fork is a/an _____ (abbreviate)

e) Finer discriminations are formed by gradually making distractors more _____ the discriminative stimulus.

... ...
... ...

88. Answer: a) stimulus generalization; b) stimulus discrimination; c) S^{D}; d) S^{Δ}; e) like, similar to (or some equivalent term)

****

89. Since stimulus generalization learning involves giving the same response to a number of S^{D}'s, program writers must be careful to avoid successive frames each requiring the same response. When a series of frames elicits the same response, a learner merely needs to <u>copy</u> his former answer on each new frame. This error was treated earlier and referred to as <u>copying frames</u>.

One means of avoiding copying frames is to change the _____ required of the learner on successive frames.

... ...
... ...

89. Answer: response, answer.

****

90. Copying frames, while not as prevalent, are still possible in stimulus discrimination learning. If one were teaching stimulus discrimination of "even numbers," and always used the number 4 as the S^D, copying frames would result even though the distractors (S^Δ's) were changed from frame to frame.

In the above example, how could the error be avoided?

... ...
... ...

90. Answer: by using other even numbers as S^D's (or equivalent answer)

****

91. For a learner to attain stimulus discrimination, he must attend to the characteristics of S^D's which make them examples. He must also learn to ignore other misleading characteristics which typify the S^Δ's. A good programmer looks for S^Δ's which are examples of common errors which learners make. Common errors are good distractors because they help the learner form finer discriminations.

The closer the S^Δ is to the S^D, the harder it is to make the discrimination. To avoid making the task too hard, writers gradually introduce the more difficult discriminations.

An examination of learner errors is helpful in finding useful _____.

... ...
... ...

91. Answer: distractors or S^Δ's.

****

92. Normally, instruction proceeds from stimulus generalization to stimulus discrimination. Suppose one were teaching the concept of "democracy" to a class of junior high school students. The instruction might be sequenced as follows:

a) Define "democracy," i.e., give the rule for identifying instances of democracy. (This step would be omitted in the Egrul strategy, since students would later be asked to generate the rule themselves.)

b) Provide examples of democracy with the label (all S^D's).

c) Ask students to label several examples of democracy (all S^D's).

d) Present individual examples, some of which exemplify democracy, some of which do not. Students identify each example as S^D (democracy) or S^Δ (not democracy).

e) Present two examples simultaneously (one S^D, one S^Δ). and have students select the S^D.

f) Present three or more examples simultaneously (some S^D's, some S^Δ's) and have students select the S^D's.

g) Repeat the previous step, but gradually introduce S^Δ's which more closely resemble democracy, the S^D.

Which steps are related only to stimulus generalization?

... ...
... ...

92. Answer: steps a,b, and c. Beginning with step d, S^Δ's are introduced to facilitate stimulus discrimination.

The next four frames (93-96) are based on steps a) to g) of frame 92.

****

93. For which step would it be <u>most</u> helpful to have a list of common errors made by junior high students in identifying democracy?

... ...
... ...

93. Answer: Step g, where finer discriminations are to be formed.

****

94. Would an example of a monarchy be an S^D or an S^Δ?

... ...
... ...

94. Answer: $S^\blacktriangle$

****

95. The difficulty of the discrimination task was increased along two dimensions. One was by using $S^\blacktriangle$'s which gradually came closer to examples of democracy. How else was the difficulty increased?

... ...
... ...

95. Answer: by increasing the <u>number of examples</u> presented at one time (any equivalent answer)

****

96. Since the instruction began with the definition or rule for identifying examples of democracy, the type of strategy can be called _____.

... ...
... ...

96. Answer: Ruleg

****

97. The illustration in frame 92, while instructionally sound, would seldom be applied in actual teaching. Typically, one would introduce at least two related concepts at the beginning of the instructional sequence (possibly

democracy and oligarchy, or others, in the above example). While the same order of instruction might be followed, it would take both concepts through the sequence, providing instruction on each concept at each step.

Proceed to frame 98.

****

98. Another aspect of program writing is concerned with the probability that a stimulus will continue to elicit the correct response in future situations. You may recall that very little school learning involves the acquisition of new responses. Rather, old responses are attached to new stimuli by the transfer of stimulus control. Suppose the learner makes the desired response to several S^D's (stimulus generalization) and does it in the presence of S^Δ's (stimulus discrimination), how can we be confident that the new discriminative stimuli will continue to elicit the desired response? In other words, how can we accomplish transfer of stimulus control in such a way that the new stimulus has a high probability of continuing to elicit the response?

One of the tasks of a program writer is to make the transfer of stimulus control so complete that the new S^D's will _____ to elicit the correct response.

... ...
... ...

98. Answer: continue

****

99. Another way of expressing this concept is to say a programmer must not only deal with response acquisition, but also with response maintenance. Acquisition of stimulus generalization occurs the first time the learner makes the correct response to several S^D's. Acquisition of stimulus discrimination

occurs when the learner does it in the presence of S^{Δ}'s as well.

A programmer who attempts to strengthen the association of the S^{D} with the response, to insure future performance, is concerned with response ____.

... ...
... ...

99. Answer: maintenance

****

100. Response maintenance is accomplished by providing the learner with many opportunities for making the response to the new stimuli. It is simply a matter of giving the learner sufficient practice. The practice should be accompanied by the gradual fading (reduction) of prompts.

The more often the learner correctly makes the response to the new stimuli, the stronger the _____ of stimulus control.

... ...
... ...

100. Answer: transfer

****

101. The powerof the S^{D} to elicit the correct response is a function of the number, or frequency of times, the learner correctly responds to the S^{D}. To an experienced driver, a red octagon is a _____ S^{D} for a braking response.

... ...
... ...

101. Answer: strong, powerful, etc.

****

102. S^{D}'s become stronger, more likely to elicit the desired response, when frequent practice is accompanied by the fading of_____.

... ...
... ...

102. Answer: Prompts.

****

103. When writing a program, one should provide practice immediately following instruction. Practice should also be provided in the form of "review" frames later in the sequence. These practice, or review, frames which appear later help to insure response_____.

... ...
... ...

103. Answer: maintenance

****

104. What is the name for a program sequence in which each learner follows the same instructional path and sees each frame?

a) Normal branching

b) Remedial branching

c) Linear branching

d) Ruleg

... ...
... ...

104. Answer: c)

****

105. Frame 104 is a review frame. Its purpose is to facilitate _____ _____

... ...
... ...

105. Answer: response maintenance

****

106. Frame 104 contains both an S^D and S^A's. Therefore, it deals with maintenance of which type of learning?

a) Stimulus generalization

b) Stimulus discrimination

... ...
... ...

106. Answer: b)

****

107. If frame 104 was the first frame in which the learner was to make the response "linear" to the description given (the S^D), it would not be related maintenance, but rather response _____.

... ...
... ...

107. Answer: acquisition.

****

108. Each time a learner makes the correct response to an S^D, the S^D becomes _____.

... ...
... ...

108. Answer: stronger

****

109. The stronger the S^D, the more _____ it is that it will continue to elicit the desired response.

... ...
... ...

109. Answer: probable, likely, etc.

****

110. Study the diagram below.

/1/ ---------> /2/ --------> /3/ ---------> /4/

The diagram is another _____ for the response "linear."

... ...
... ...

110. Answer: S^D (discriminative stimulus)

****

111. Suppose frame 110 was followed by several frames, each of which described linear programs in a slightly different fashion, but all elicited the "linear response" with no S^Δ's present.

These frames, occurring at this point in the program, would relate to maintenance of _____ _____.

... ...
... ...

111. Answer: stimulus generalization

****

112. When two or more related concepts are defined in the first step of an instructional sequence, one can be used as an S^Δ for the other. This plan makes it easier to reach stimulus discrimination.

In this program, the definitions of linear and branching programs occurred in the first two frames. Thus, for the correct response "branching," a description of a branching program was the _____ (a), while a description of a linear program was the _____ (b).

... ...
... ...

112. Answer: a) S^D; b) S^Δ

****

113. Discrimination of the Ruleg strategy would be facilitated by pairing it with the _____ _____.

... ...
... ...

113. Answer: Egrul strategy

****

114. Discrimination of "normal branching" is enhanced by pairing it with _____ branching.

... ...
... ...

114. Answer: remedial

****

115. When teaching linear wash ahead, one should also teach linear _____ ____

... ...
... ...

115. Answer: wash back

****

116. Selected responses and constructed responses are closely related concepts and might well be taught together. This is also true for the two other types of responses: a) observable responses, called _____ (a) responses and b) non-observable, or mental responses, called _____ (b) responses.

... ...
... ...

116. Answer: a) overt; b) covert

****

117. The two types of prompts which were introduced simultaneously are _____ and _____.

... ...
... ...

117. Answer: formal, thematic (either order)

****

118. The preceding review frames have, hopefully, strengthened the relationship between particular responses and certain controlling stimuli. The type of practice they provided, however, dealt only with the recall of terminology. Most teachers readily recognize the futility of this type of practice.

If you had been asked to construct, in your own words, definitions for the terms, or to demonstrate stimulus discrimination with S^{Δ}'s that closely approximated the S^{D}'s, educators would agree that the practice had been far more valuable. This type of practice is identical, or nearly so, to a demonstration of the fact that the pupil has mastered the program objectives, for it asks him to perform the terminal behavior. Frames which ask the learner to perform the terminal behavior are called criterion frames.

Practice, or review frames, are more effective for response maintenance when they require the learner to perform a _____ _____.

... ...
... ...

118. Answer: terminal behavior or program objective.

****

119. Criterion frames (test frames) provide checks on learner mastery for both the program writer and the student. The writer uses information from criterion frames to determine whether the program needs to be revised and improved. The student uses them to find out how well he is doing.

If a program writer wishes to use information from criterion frames for evaluating his program, the responses would have to be _____.

... ...
... ...

119. Answer: overt (observable)

****

120. Some learning involves not merely transfer of stimulus control for a single stimulus and a single response, but an ordered sequence of tasks. For example, assembling a radio, threading a projector, loading a camera, factoring equations, or computing square roots on a slide rule, all consist of a number of separate tasks which must be performed. Usually the sequence in which the separate tasks are performed is an essential part of the entire operation. Instruction which includes ordering (sequencing) of several tasks is called chaining.

Would chaining be involved in learning to make a tape recording of a speech?

... ...
... ...

120. Answer: yes; there are several responses to be made and the sequence is important.

****

121. When preparing instruction for a chaining task, the programmer first identifies each task in the chain, arranges them in the order in which they would be performed, and numbers them consecutively. Thus task "1" would be the one to be performed first, number 2 the second, etc.

Assume the diagram below represents the five tasks (links) in a 5-link chaining activity. In which order would they be performed? ___, ___, ___, ___, ___.

1 -----> 2 -----> 3 -----> 4 -----> 5

... ...
... ...

121. Answer: 1, 2, 3, 4, 5

****

122. The sequence of instruction, however, does not necessarily have to follow the same order. If the instruction for the diagrammed chain in frame 121 proceeded from 1 to 5, it would be called <u>forward chaining</u>. However, if instruction began with link 5 and followed a reverse order, 5 - 1, it would be called <u>backward chaining</u>.

In which order would the five tasks be performed if <u>backward chaining</u> were used in the instruction? ____, ____, ____, _____, _____

... ...
... ...

122. Answer: 1, 2, 3, 4, 5. The order of <u>performance</u> is unchanged regardless of the instructional sequence.

****

123. Consider the following oversimplified example: Playing the piano involves 1) identifying printed musical notes, 2) placing the correct finger over the piano key represented by that note, and 3) properly striking the key. Obviously the chain is far more complex than this, but suppose a piano teacher began the instruction by having the student play a brief melody with one hand after observing the teacher's example. Which type of instructional pattern would be illustrated? _____ _____

... ...
... ...

123. Answer: backward chaining

****

124. Until recently, almost all instruction in chaining tasks was by forward chaining. While the logical appeal of having instruction sequenced the same as the order of performance is strong, there may be serious drawbacks as well. Consider the case of a young person who would very much like to be

able to play the piano. His teacher devoted six months of instructional time to the tasks of naming the notes on compositions, and finding the appropriate key on a simulated keyboard. After six months, the learner could perform these tasks very well, but had not yet struck a note on a piano.

In such an extreme case the student's _____ is very likely to be lost or destroyed.

... ...
... ...

124. Answer: motivation, interest, ambition, etc.

****

125. Learner interest can usually be maintained or even heightened in chaining activities that are long or complex, by _____ _____.

... ...
... ...

125. Answer: backward chaining

****

126. Many music teachers, and other teachers, attempt to make their instruction "the best of all possible worlds," by combining forward chaining with some terminal behavior. Our music teacher in the earlier example might have had the learner spend part of the time on tasks 1 and 2, and part of the time on actually playing simple pieces. The chaining, however, is still <u>forward</u>.

Lengthy forward chains, by themselves, suffer from what kind of drawback? _____.

... ...
... ...

126. Answer: They may destroy the learner's interest (or any equivalent statement).

****

127. Given the following sequence of tasks, what number should the programmer assign to the task "setting the lens opening" if the instruction is to be by backward chaining?

"Open the back of the camera"

"Insert the film cartridge with red dot up"

"Close the camera"

"Obtain a light meter reading"

"Set the lens opening"

"Set the exposure time"

"Take the picture"

... ...
... ...

127. Answer: 5. Numbers are assigned in order of <u>performance</u>, not instruction.

****

128. If instruction for the sequence in frame 127 were by backward chaining, the learner would first be given a loaded and "set" camera, and taught to expose the film (take a picture). The next step in the instruction would be to have him set exposure times when given a loaded camera and a light meter reading. What would be given the learner when teaching step (link) 2?

a) closed camera and film

b) camera and light meter

c) a film cartridge and an open camera

... ...

128. Answer: c) learning to open the camera is the last instructional step.

****

129. When learning a chaining sequence (forward or backward) the learner should repeat all learned links of the chain each time a new link is _____.

... ...
... ...

129. Answer: added

****

130. This does not mean that each time a learner practices a new link he has to perform all learned links. However, on <u>at least one</u> occasion that new link should get "hooked up" to the chain by performing all learned links.

Suppose one is memorizing five verses of a poem he is to recite, and begins by learning verse 5, then verse 4. He should now practice reciting 4 then 5 before learning verse 3.

In this example the order in which he is learning the verses is _____, _____, _____, _____, _____.
(a)

The order in which they will be performed is _____, _____, _____, _____, _____.
(b)

... ...
... ...

130. Answer: a) 5, 4, 3, 2, 1; b) 1, 2, 3, 4, 5

****

131. Learning each link in a chain is subject to all the same rules and guidelines as any other task.

If the ninth link in a chain is to name and identify the key of f sharp, the instruction should still be concerned with stimulus _____ and stimulus _____.

... ...
... ...

131. Answer: generalization, discrimination (either order)

****

132. In learning a forward chaining sequence, what will the learner do after mastering link 2?

a) learn link 3

b) learn link 1

c) practice links 1 ----2

d) practice links 2 ----1

... ...
... ...

132. Answer: c

****

133. In a chaining sequence the learner will always practice the links in a _____ manner, while the instruction may proceed either _____ or _____.
(a) (b)

... ...
... ...

133. Answer: a) forward; b) forward or backward (either order)

****

134. Response maintenance is also very important in a chaining sequence. Not only must each separate link be maintained, but also the order of the responses.

How would a programmer provide for maintenenace of the entire chain, i.e., the performance order? _____

... ...
... ...

134. Answer: By providing opportunities for practicing the entire chain (or an equivalent answer incorporating the effects of practice)

****

135. Define copying frame.

... ...
... ...

135. Answer: A copying frame is a frame where the responder need not have acquired the desired behavior. He simply copies a word, phrase, or number with no internal (mediating) behavior. (Or any equivalent answer)

****

136. Define generalization.

... ...
... ...

136. Answer: Giving the same response to different stimuli. (Or any equivalent answer)

****

137. Define discrimination.

... ...
... ...

137. Answer: Discrimination is responding to a particular stimulus (S^D) when it is presented among other stimuli (S^Δ's). (Or any equivalent answer)

****

138. Describe backward chaining.

... ...
... ...

138. Answer: Learning a chaining sequence by learning first the last link of the chain when it will be performed. One next learns the next to the last link and then the last, etc., until finally the entire chain is learned. The final performance is the same as those learning the chain in a forward manner. (Or any equivalent answer)

****

139. Describe maintenance.

... ...
... ...

139. Answer: Response maintenance is accomplished by providing the learner with many opportunities for making the response to the new stimuli. It is simply a matter of giving the learner sufficient practice. The practice should be accompanied by the gradual fading (reduction of prompts.

****